



US006112184A

United States Patent [19]

[11] **Patent Number:** 6,112,184

O'Brien, Jr.

[45] **Date of Patent:** *Aug. 29, 2000

[54] **SITE WORKSPACES LAYOUT PROCESS EMPLOYING MDS AND A PDI FORMULA IN WHICH DENSITY IS BASED ON AREA OF CIRCUMSCRIBING-CONVEX-HULLS**

5,402,335 3/1995 O'Brien 364/512

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[57] **ABSTRACT**

[73] **Assignee:** The United States of America as represented by the Secretary of the Navy, Washington, D.C.

A process is provided for producing layouts of building units on a quadrilateral facility site, and layouts of personnel workstations and items of equipment (collectively "workplace elements") in quadrilateral subarea in the building units. There are inter-building-unit, and inter-workplace-element, operational criteria associated with the activity being performed in the facility. The well known multi-dimensional scaling (MDS) methodology is employed in optimizing building unit and workplace element configurations to suit the operational criteria. Measurement of population density index (PDI) is employed to judge whether candidate configurations of building units and workplace elements result in adverse crowdedness conditions. The PDI employed for this purpose is novel. The novelty of the PDI is its use of a "convex hull" (in the mathematical sense of the term) circumscribed about the perimetrical objects in a candidate configuration. The equation for the PDI then employ the polygon interior of the convex hull in calculation of a density related term of the equation.

[*] **Notice:** This patent is subject to a terminal disclaimer.

[21] **Appl. No.:** 08/635,417

[22] **Filed:** Mar. 28, 1996

[51] **Int. Cl.⁷** G06F 17/50

[52] **U.S. Cl.** 705/5; 364/512

[58] **Field of Search** 364/512, 578,
364/468.04; 434/72; 395/919, 921, 923;
705/1, 5, 6, 8

[56] **References Cited**

U.S. PATENT DOCUMENTS

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12 Claims, 9 Drawing Sheets

12a
(STARTING
PORTION OF
GLOBAL AREA
TIER OF
PROCESS
10)

SELECT QUADRILATERAL GLOBAL AREA AND BUILDING UNITS TO BE LOCATED THEREIN TO FORM A FACILITY WHOSE FUNCTION IS DEPENDENT UPON MULTIPLE OPERATIONAL CRITERIA

18

GENERATE CARTESIAN PLOT OF A NORMATIVE CONFIGURATION OF BUILDING UNITS IN GLOBAL AREA

20

COLLECT SETS OF DATA REPRESENTING DEGREES OF ASSOCIATION OF EACH OPERATIONAL CRITERION AMONG ALL PAIRS OF BUILDING UNITS

22

GENERATE A NON-METRIC MDS MATRIX FOR EACH SET OF OPERATIONAL CRITERION DATA USING THE NORMATIVE CONFIGURATION AS AN INPUT

24

COMBINE OPERATIONAL CRITERION MDS MATRICES, UNIFORMLY WEIGHT BUILDING UNITS, AND SUBJECT TO NON-LINEAR STRESSING TO PRODUCE A COMPOSITE OPERATIONAL CRITERIA CONFIGURATION CARTESIAN PLOT OF BUILDING UNITS IN GLOBAL AREA

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